ABSTRACT

The invention provides a process, catalyst and apparatus for carrying out the water-gas shift reaction comprising employing a low-pyrophoricity water-gas shift reaction catalyst; wherein the low-pyrophoricity water-gas shift reaction catalyst comprises a solid high heat capacity particulate support impregnated with: (i) a reducible metal oxide and (ii) a catalytic agent.

UNITED STATES PATENT AND TRADEMARK OFFICE
DOCUMENT CLASSIFICATION BARCODE SHEET

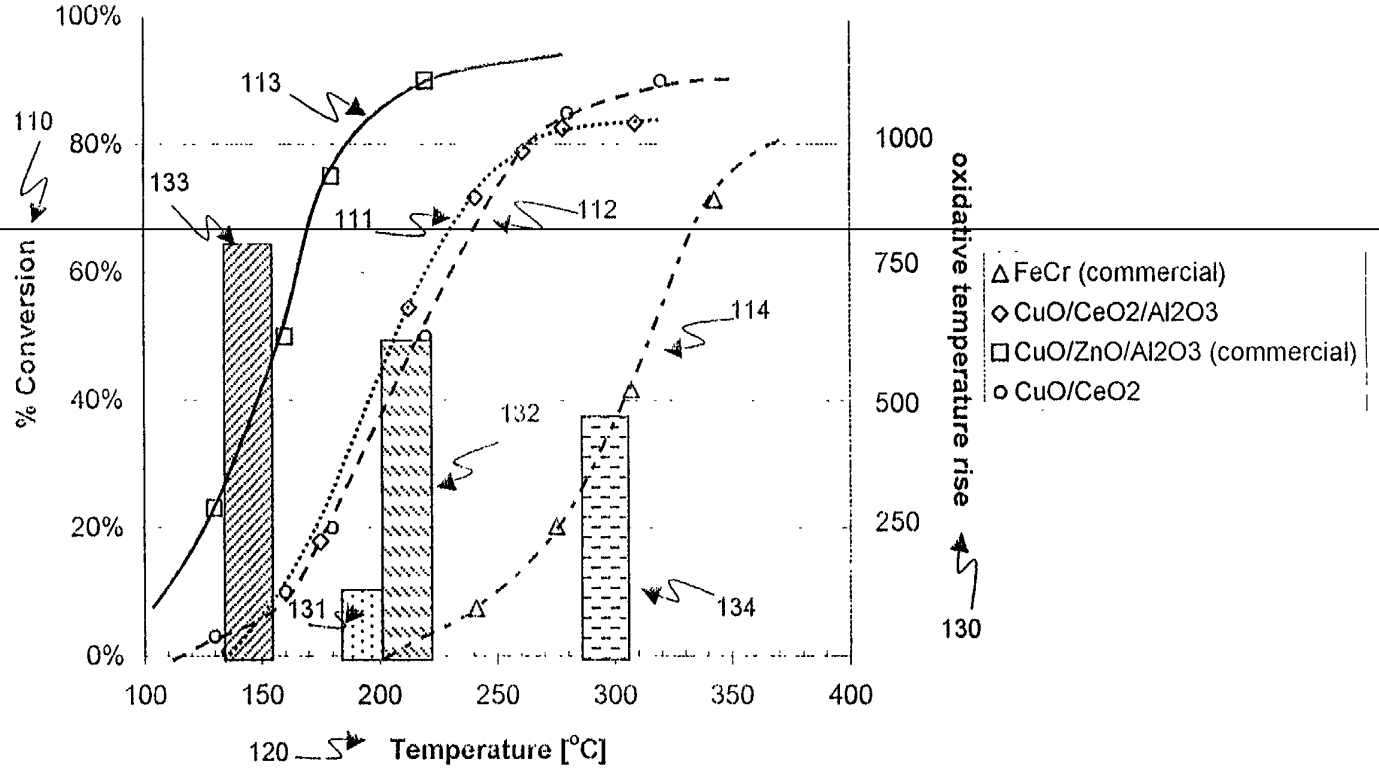
Drawings

7

Level - 2
Version 1.1

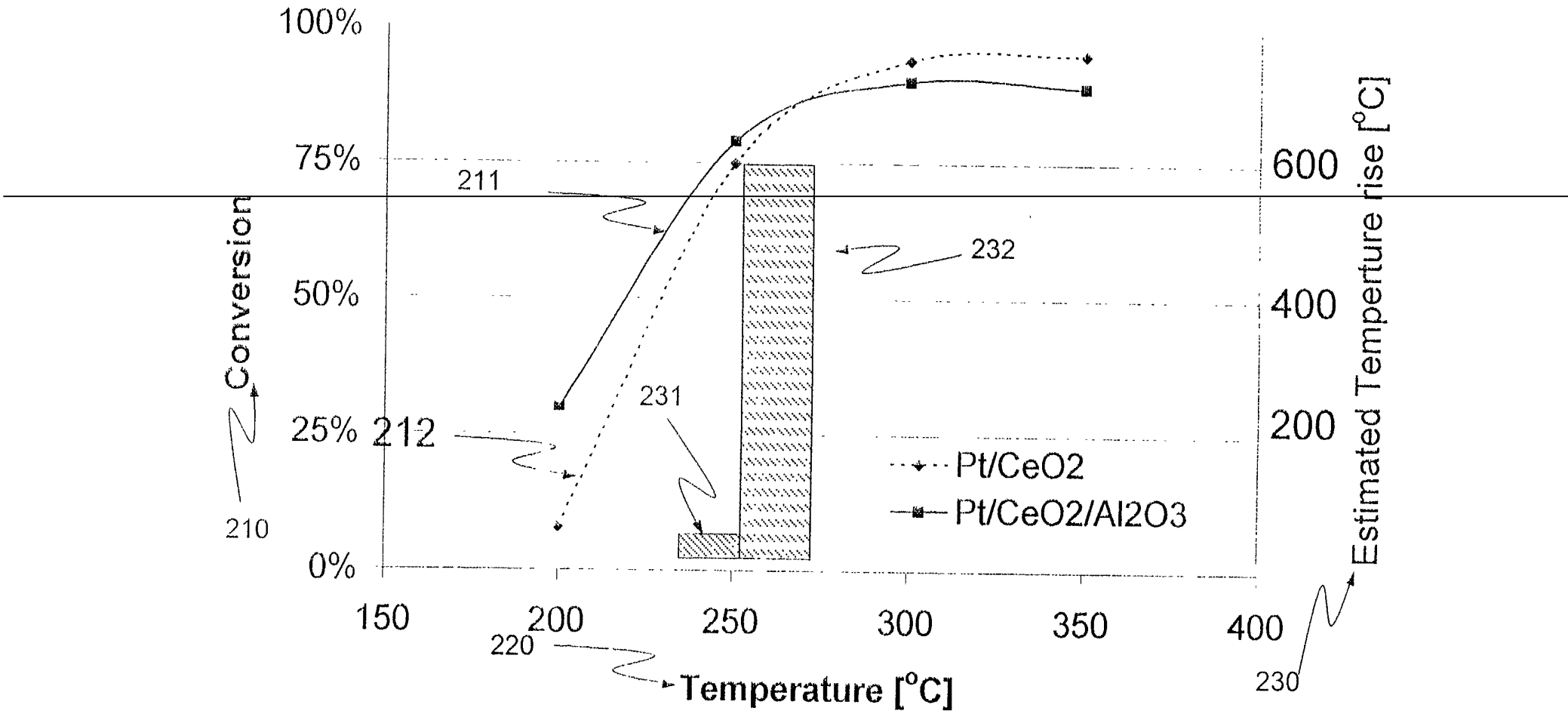
Figure 1

Activities (lines) and pyrophoricity (columns) of FeCr, $CuO/ZnO/Al_2O_3$, CuO/CeO_2 and $CuO/CeO_2/Al_2O_3$ 2% CO, 10% H_2O, 20% H_2, 5% CO_2; VHSV = 5,000 h^{-1}

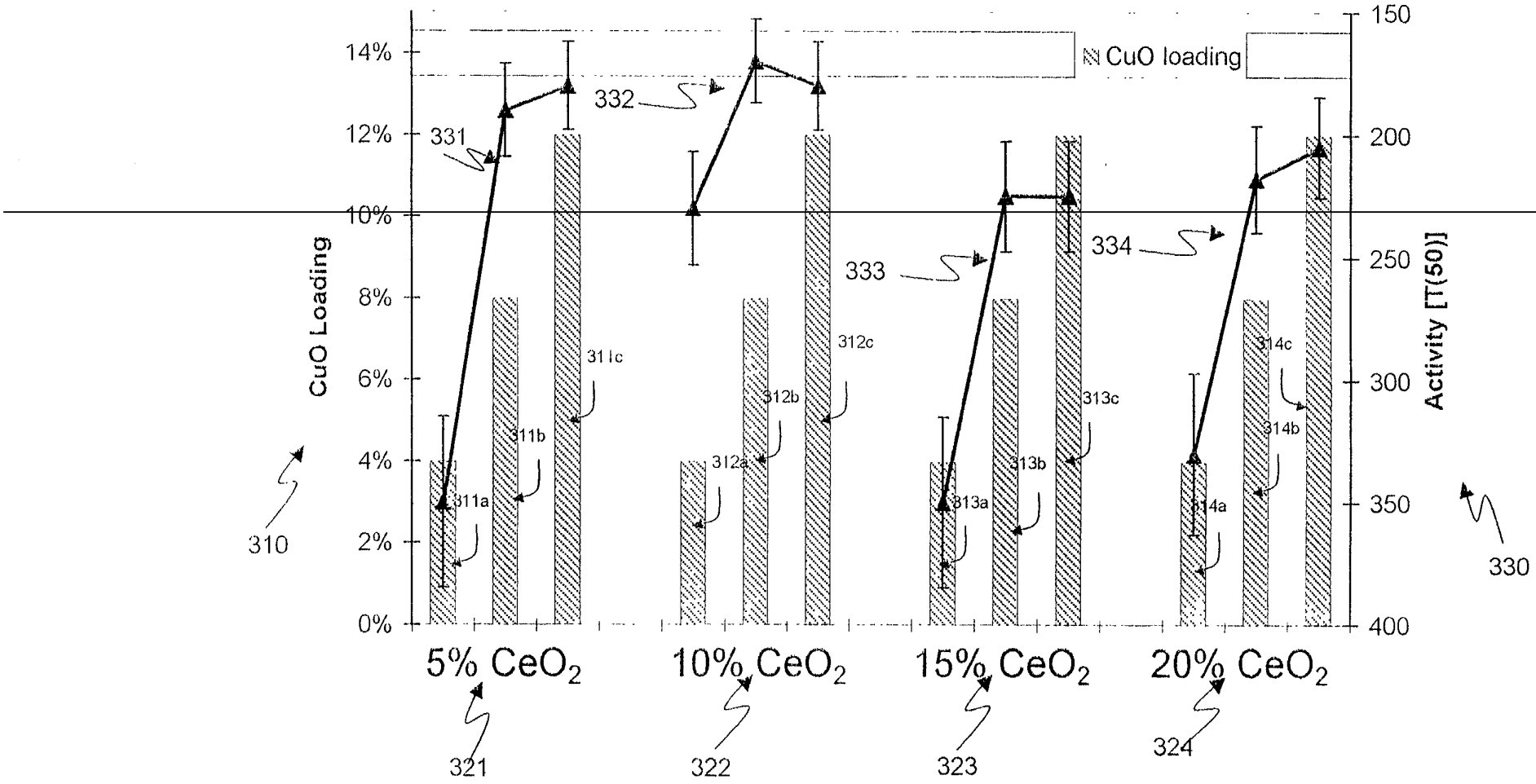


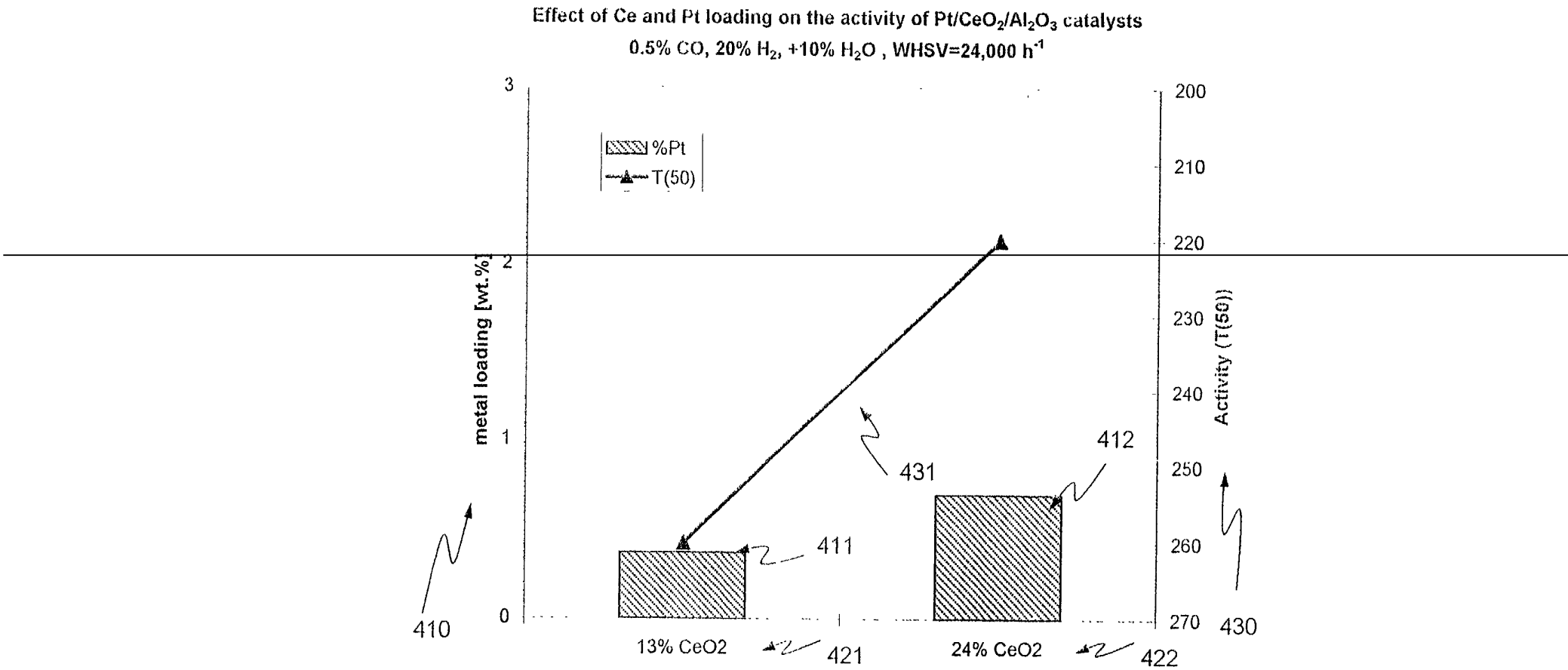
Comparison of activity (lines) and pyrophoricity (columns) of Pt/CeO_2 and $Pt/CeO_2/Al_2O_3$ catalysts

0.5% CO, 20% H2, +10% H2O, WHSV=24,000 h^{-1}

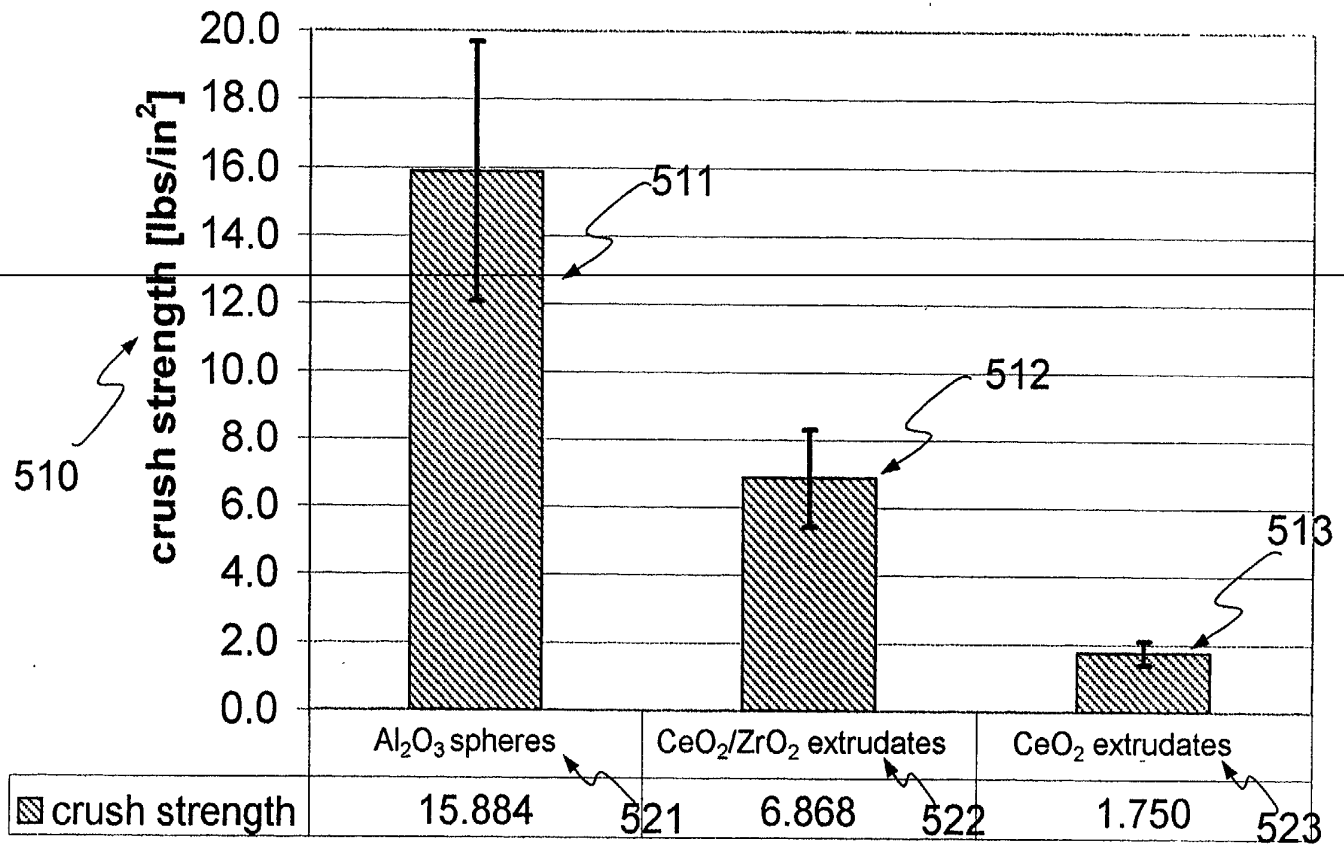


Dependence of WGS activity on Ce- and Cu-loading
(18,846-29+38, samples WR-66,75, exp. WR-67,76,78)
test conditions: 2% CO, 20% H_2, +10% H_2O balance N_2 WHSV = 30,000 h^{-1}





Crush strength of catalyst support particles
Average and standard deviation of 20 samples



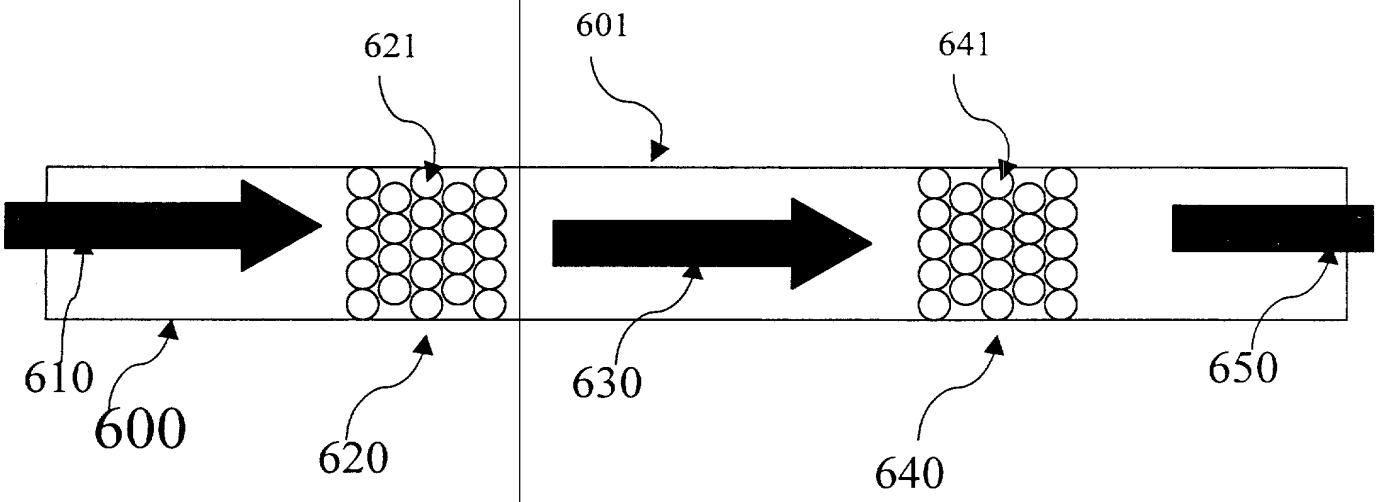


FIG. 6

Figure 7: Effect of Cr_2O_3 Level on the Catalytic Activity of CuO/Al_2O_3 WGS Reaction Catalysts

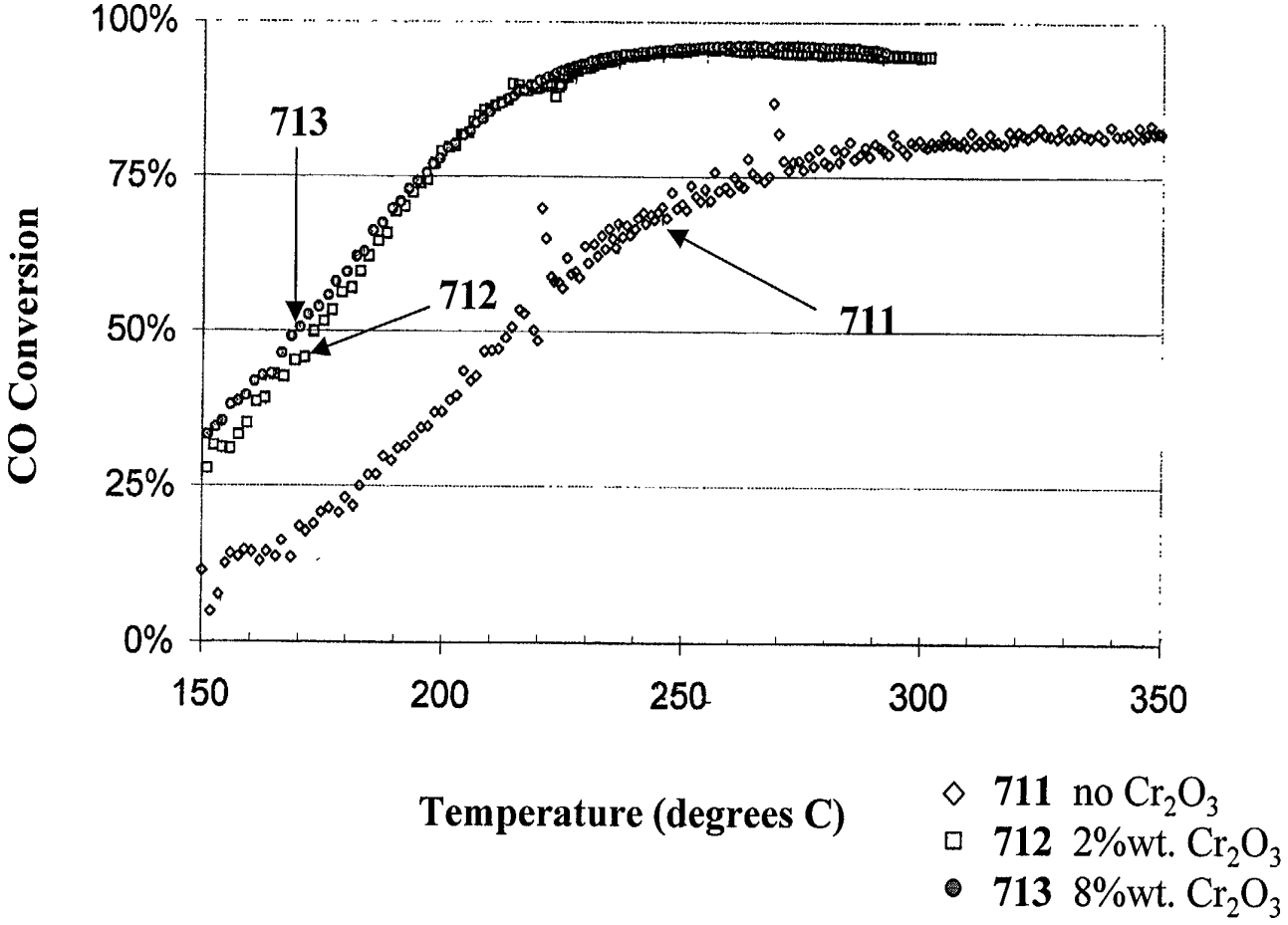


Figure 8: Effect of Cr_2O_3 Level on the Catalytic Activity of $CuO/CeO_2/Al_2O_3$ WGS Reaction Catalysts

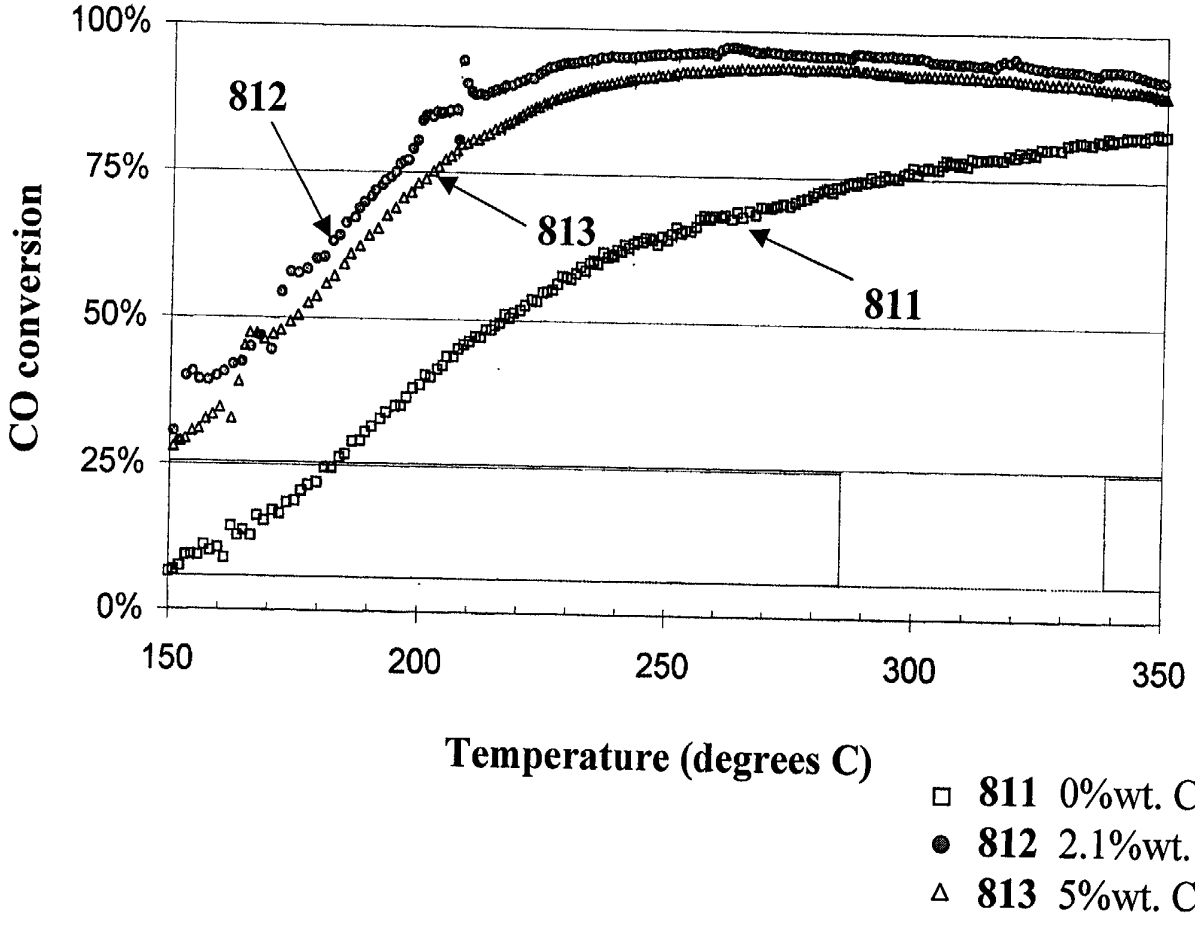


Figure 9: Effect of the Sequence of Synthetic Steps on the Catalytic Activity of $CuO/Cr_2O_3/CeO_2/Al_2O_3$ WGS Reaction Catalysts